

Exhibit 138



ETN Business Overview

CRO Department

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EXHIBIT

138

Agenda

⌚ Part 1: Introduction & Business Overview

⌚ Part 2: Key Risks

⌚ Part 3: ETN Flag Framework (ex-VIX)

⌚ Part 4: VIX Flags Calibration

Part 1

Introduction & Business Overview

Introduction

- ⌘ ETN's in general are senior, unsecured debt securities issued by a bank.
 - In our case, CS AG (Nassau Branch) and backed by CS AG's credit.
- ⌘ ETN's, along with ETF's, are designed to provide investors access to a particular trading strategy or a theme, e.g.:
 - Leveraged exposures
 - Non-equity exposures
 - Merger Arb or Market Neutral strategies
 - Global Warming or Robotics themes
- ⌘ Key differences between ETN and ETF are:
 - Legal/Regulatory: ETF's issued by a fund/asset manager, ETN's by a bank, and are regulated differently.
 - Credit risk: ETF's are bankruptcy-remote and backed by assets held in the fund, while ETN's are backed by issuer's credit only.
 - Cost structure: ETF's have fees + tracking error, ETN's typically just fees.
 - Funding: ETN proceeds also serve as a funding source for the bank.

CS ETN Lineup (1)

- 8 CS participates in a range of asset classes and trading strategies.
- 8 Products are segmented into several business lines driven by target customer base as well as other marketing reasons.

		Business Line			
		Axela Trader	Velocity Shares	X-Links	Custom
Target group:		Traders, sophisticated investors	Traders, sophisticated investors	"Retail"	Specific asset managers
Asset	Equity Price			AMJL REML	FIEU FLGE MLPO
	Equity Vol		TVIX, TVIZ VIIX, VIIZ XIV, ZIV		
	Commodity	DBRT UBRT	DGAZ, UGAZ DWTI, UWTI	OIIL USOI	
	Precious Metals		DGLD, UGLD DSLX, USLV	GLDI SLVO	
	Multi-Asset			MLTI	

CS ETN Lineup (2)

8 In general, more bespoke nature and shorter horizon of ETN's appeal to a customer base with higher risk appetite, with ETN's typically driven by riskier underliers and greater leverages (apart from "Equity Price"), and ETN issuers taking on more risk away from exchanges & brokerages.

8 "Equity Price" ETN's are least risky with low leverages and largest ETN's being on major liquid indices.

8 Commodity ETN's have been less risky prior to 2017 with Crude Oil dominating the exposure, however, with the increased demand for Natural Gas ETN's, they are currently one of the riskiest.

8 "Equity Vol" ETN's are among the riskiest due to considerably higher volatility of the underlying and high demand driving greater exposure relative to liquidity.

8 Precious Metals ETNs exposure has been driven by riskier Silver, however demand hasn't been as high as for Natural Gas, with outstanding FX Delta peaking at \$1bn.

Current exposures as of 26-Jan-2018

\$Millions

Asset Group	Underlier	ETN	Lvrg	AUM	Delta/Vega
TOTAL				-4,205	
Equity Price				-2,280	-4,481
	Russell 1000 Growth	FLGE UP	2	-1,887	-3,775
	SX5E	FIEU UP	2	-289	-579
	S&P MLP	MLPO UP	1	-79	-79
	FTSE NA REIT	REML UP	2	-21	-42
	Alerian MLP	AMJL UP	2	-3	-6
Commodity				-723	225
	Natural Gas Futures	DGAZ UP	-3	-389	1,168
		UGAZ UP	3	-174	-523
	WTI Crude Oil Futures	UWTIF UV	3	-145	-434
		DWTIF UV	-3	-8	25
		OIIL UP	1	-3	-3
	Brent Oil Futures	UBRT UP	3	-2	-7
		DBRT UP	-3	-0	0
	USO ETF	USOI OQ	1	-1	-1
Equity Vol				-709	35
	VIX Futures	XIV	-1	-403	33 Vega
		ZIV	-1	-223	14 Vega
		TVIX	2	-74	-12 Vega
		VIIX	1	-10	-1 Vega
		VIIZ	1	1	0 Vega
		TVIZ	2	-0	-0 Vega
FX Precious Metals				-492	-1,168
	Silver Futures	USLV UQ	3	-273	-820
		DSLV UQ	-3	-14	41
	Gold Futures	UGLD UQ	3	-119	-357
		DGLD UQ	-3	-13	39
	GLD ETF	GLDI UQ	1	-36	-36
	SLV ETF	SLVO OQ	1	-37	-37
Multi-asset				-1	-1
	NYSE Multi-Asset	MLTI UP	1	-1	-1

Business Performance

8 **Capital-light business, constrained mainly by Balance Sheet.**

8 Revenues

- TOTAL Revenues range around 1-2% per AUM.
- Creation/redemption fees (~5-15bp)
- Management fees (~50-150bps)
- Lending fees (~1-6%)
- Funding (overnight)

8 Costs

- Exchange/marketing fees
- Funding on certain ETFs (e.g. futures)

8 Balance Sheet:

- HQLA (High Quality Liquid Assets): drives majority of Treasury costs (~\$20m for 2017)

8 Capital: minimal

- Market Risk RWA: Minimal
- Credit Risk RWA: ~Zero
- Ops Risk RWA: Minimal

Fig 1. Cumulative YTD P&L \$M

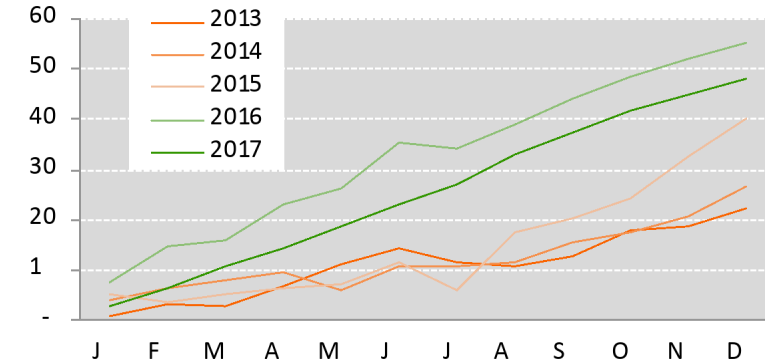
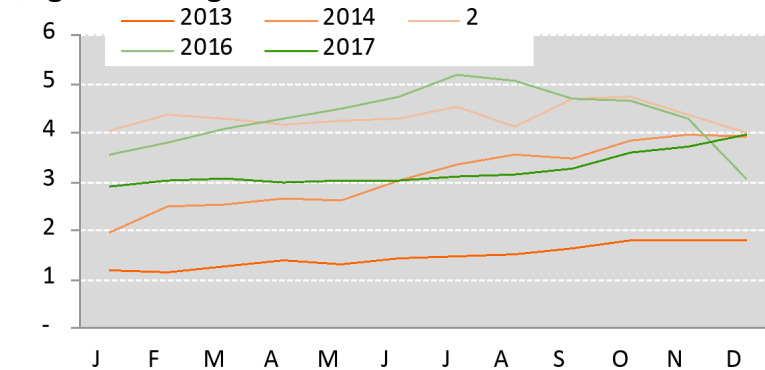


Fig 2. Average AUM \$Bn



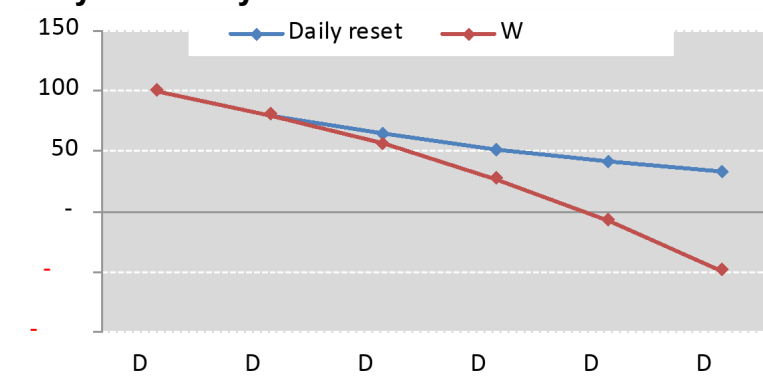
Payoff

- **Linearity:** ETNs are mostly linear instruments that return periodic performance of an underlying instrument.
(With the exception of 3 small unlevered ETNs that embed a covered call strategy [GLDI, SLVO, USOI])
- **Leverage:**
 - Is introduced to allow easier access to leverage, currently ranging from -3x to +3x.
 - Exposes ETN holder to negative Leverage gamma, and ETN Issuer to wrong-way hedge rebalancing.
- **Reset / Compounding:**
 - In case of leverage, ETNs typically reset daily, in some cases monthly or even quarterly.
 - Shorter reset period reduces knock-out gap risk, covered further in the presentation.

Example

		Day0	Day1	Day2	Day3	Day4	Day5
Underlying Index	Level	100	120	144	173	207	249
	Daily %		20%	20%	20%	20%	20%
	Cumul %		20%	44%	73%	107%	149%
-1x ETN (Daily reset)	Level	100	80	64	51	41	33
	Daily %		-20%	-20%	-20%	-20%	-20%
	Cumul %		-20%	-36%	-49%	-59%	-67%
-1x ETN (Weekly reset)	Level	100	80	56	27	-7	-49
	Daily %		-20%	-30%	-51%	-127%	563%
	Cumul %		-20%	-44%	-73%	-107%	-149%

Daily vs Weekly Reset



Hedging

- ⌘ Hedges are rebalanced daily to match the payoff exactly and leave the book delta flat.
- ⌘ Hedging is done mainly in the TAS Market (Trade-at-Settlement).
 - TAS order is an after-close order where bid-offer quantities and bid-ask spreads to the EOD settlement can be submitted throughout the day. Final execution will be at whatever the EOD settlement price is determined at 16:15, plus the order spread.
 - TAS orders are not guaranteed and can go unfilled with insufficient liquidity, in which case trader has to go back to the regular market at 16:30 or later and execute remaining hedges although with smaller liquidity and taking the price risk
 - In some cases, traders choose to execute in open market if they determine that the cost of hedging is more optimal.
- ⌘ Rebalancing occurs for several reasons:
 - In case of futures, daily roll from one expiry to the next (typically the smallest contributor)
 - Creation/redemption by market makers on the back of customer activity
 - Full unwind or retirement
 - In case of leverage, rebalancing due to leverage gamma
- ⌘ Hedge Sources: all hedges are rebalanced by EqD ETN Trader with sources varying by ETN including:
 - Direct exchange
 - Internal CS Commodity desk for Commodity futures
 - Internal Cash/Swap desks, e.g. for stock baskets or custom indices

Historical View

- 8 First ETN issued in 2008 (GWO), but offerings started expanding in late 2010.
- 8 Currently, 26 active ETNs, with ~43 ETNs total issued, and ~17 called or retired.
- 8 Net AUM peaked at ~\$5.5bn with Commodities ~\$1.9bn, Equity Price ~\$1.6bn, Equity Vol ~\$1.4bn.

Fig 4. Peak Asset Class Exposures (Delta/Vega)

	Peak Exposure	Driver (Grouped by hedging Instrument)
Commodity Delta		
Nov 2016	5.4bn	4.2bn on UWTI+DWTI (+/-3x Oil Futures)
Dec 2017	3.9bn	3.5bn on UGAZ+DGAZ (+/-3x Gas Futures)
FX Delta		
Aug 2016	1.5bn	1.0bn on USLV+DSLX (+/-3x Silver Futures)
Equity Delta		
Jan 2018	4.5bn	3.7bn on FLGE (2x Russell 1000)
Equity Vega		
Oct 2015	87m	81m on XIV+TVIX+VIIX (-1/+2/+1x VIX Futures)

Fig 1. CS ETN AUM \$Bn

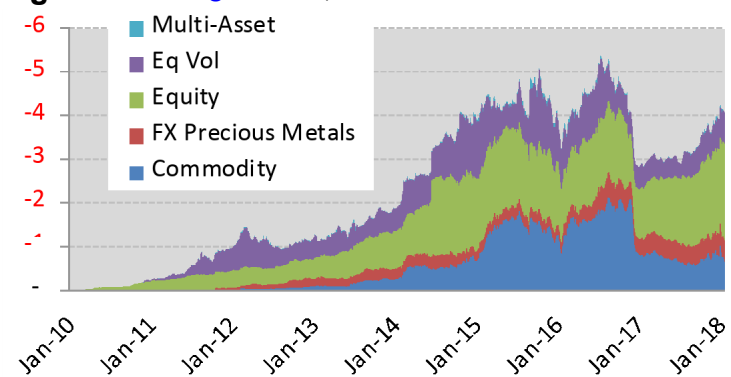


Fig 2. Delta: Commodity + FX + Equity \$Bn

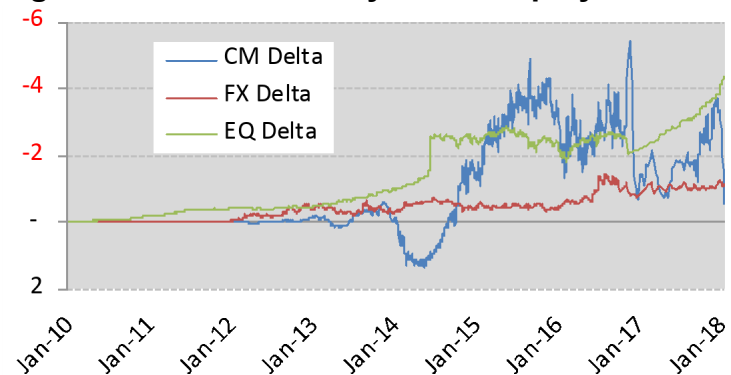
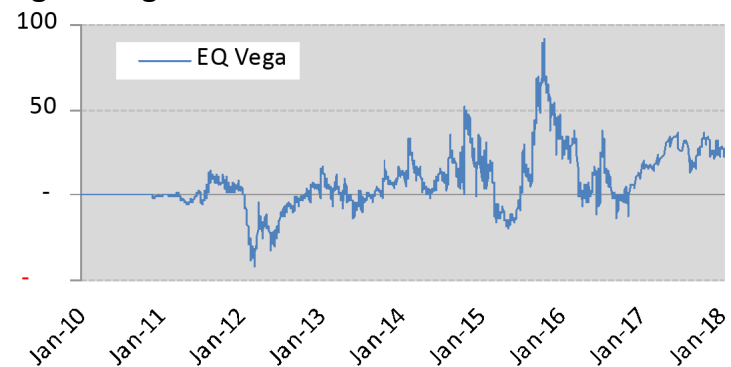


Fig 3. Vega: VIX \$M



Part 2

Key Risks

Key Risks

⌘ ETN's pose mainly 2 key risks: liquidity and knock-out gap.

- Other risks like reputational are second-order, and will be mentioned later in the presentation.

⌘ Liquidity:

- Risk of not having sufficient liquidity to rebalance required hedges and remaining exposed to the following trading day's move.
- Main sources of liquidity risk are:
 - ⌘ Creation / redemption
 - ⌘ Full unwind via early issuer call or expiry
 - ⌘ Leverage Gamma: rebalancing due to leverage and market moves

⌘ Knock-out Gap:

- Present only in levered ETNs.
- Arises due to mismatch between ETN's and Hedges beyond the point of ETN dropping to zero, where ETN is floored at zero, while leveraged hedges continue accruing a loss for a sufficiently large underlying move.
- E.g.: -3x DGAZ: Natural Gas spikes up by +40%, -3x Levered performance is -120%, however ETN drops to Zero, while Hedge loss exceeds ETN gain by 20%.
- ETNs typically also have an Early Acceleration Option in case ETN loses a substantial value intra-day, e.g. -80% or more.

Key Risks: Liquidity: Leverage Gamma

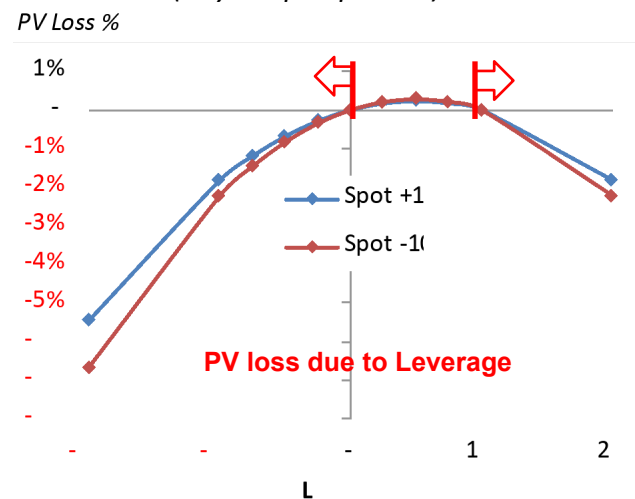
While creation/redemption and full unwind are simple sources of risk due to quantity change, we'll take a deeper look into Leverage gamma.

Leverage:

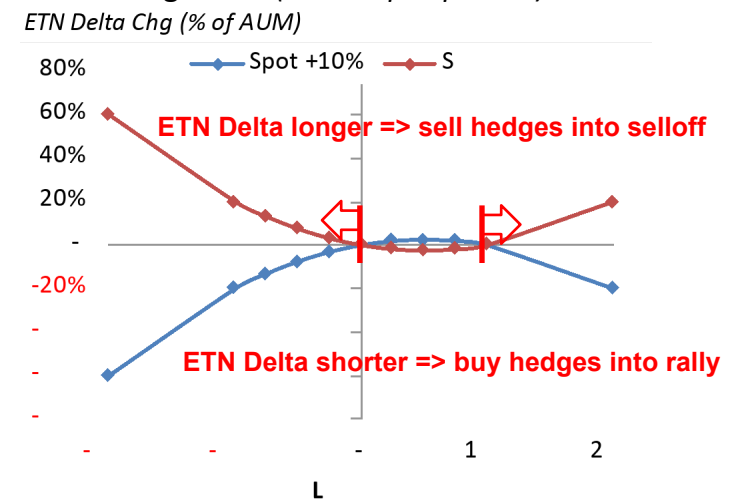
- Exposes ETN holder to wrong-way Price effect, and ETN Issuer to wrong-way hedge rebalancing effect.
- More generally, leverage gamma is always adverse for **Leverage < 0 or > 1**, and benign otherwise. (see quantification in Part 2. Appendix A.)

2 Effects: wrong way for **Leverage < 0 or > 1**, right-way otherwise:

Price Effect (Buyer's perspective)



Rebalancing Effect (Issuer's perspective)



Risk Management and Mitigants are covered in detail in Part 3 (ETN Flag Framework).

Key Risks: Knock-out Gap

⌘ **Risk** of loss due to ETN dropping to Zero for a sufficiently large underlying move, while hedges continue accruing losses.

⌘ **Key payoff features** to consider for risk management:

– **Daily reset:**

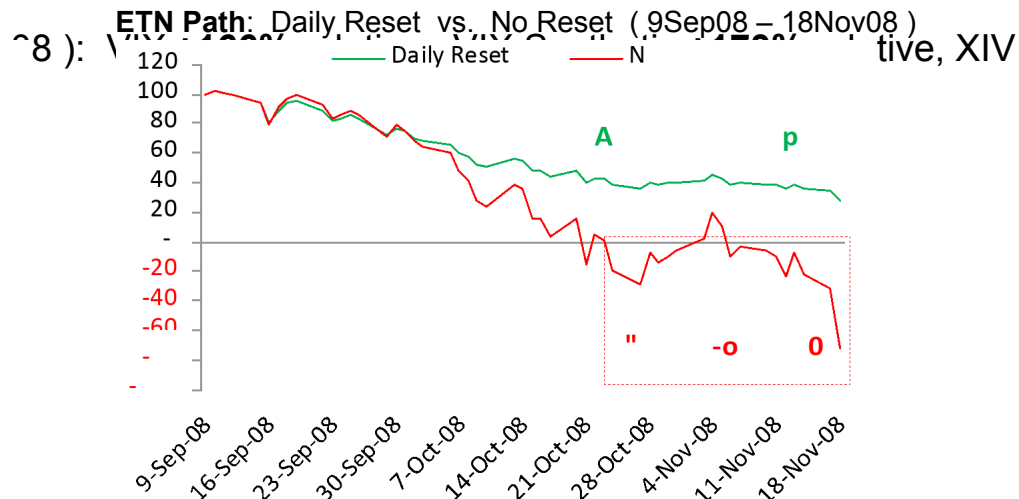
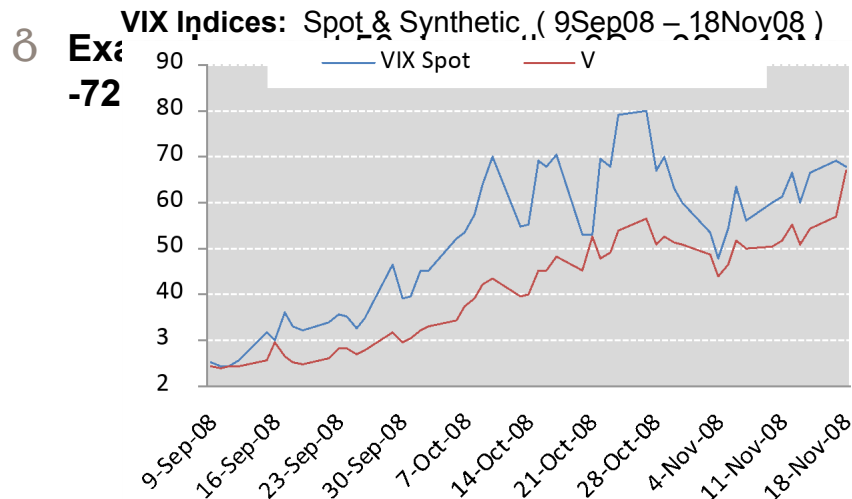
⌘ All riskier ETN's have daily resetting, i.e. ETN losses over multiple days decrease in magnitude with every reset.

⌘ Reduces ETN knock-out probability.

– **Futures basket as an underlying:**

⌘ All riskier ETN's are based on a basket of futures (typically 1st and 2nd) rather than spot, where Beta to Spot decreases the longer the expiry.

⌘ VIX Spot never doubled since 1987 in 1 day, while it would take worst 20 days for VIX Synthetic to double.



Key Risks: Knock-out Gap: Further look into XIV ETN

⌘ Events that XIV ETN would have or did survive since 1987 but prior to February 2018:

- **General Market:** all Asian crises, Russia default, 2007-08 Credit crisis.
- **Technological:** all flash crashes, with largest in 2010, when systematic trading was less regulated/transparent.
- **Political:** US Downgrade, Brexit, North Korea scare.
- **Attacks:** September 11th.

⌘ Largest VIX Spikes since 1987 but prior to February 2018 [Fig 1.]:

- Synthetic **+33%**: largest 1-day move (excluding 1987).
- Synthetic **+53%**: looking at a more conservative intra-day high (based on a modeled estimate)
- Spot **+64%**: largest 1-day move (excluding 1987).
- Spot **+90%**: looking at a more conservative intra-day high (based on a modeled estimate).

⌘ Is 1987 a realistic scenario today?

- Listed options market in its infancy:
 - ⌘ Only 4yrs since listed index options launch in 1983.
 - ⌘ 14yrs since Black-Scholes published and CBOE first ever listed options launch in 1973.
- Market depth and liquidity a tiny fraction of what it is today.
- Flat skew as market was not pricing downside crash risk.

Fig 1. Largest VIX Spikes (Relative %)

Date	SPX		Start Level	VIX Spot		VIX Synthetic		Futures Beta	Volume Spike**	Event
	Close to Close	Close to Low		Close to Close	Close to High	Close to Close	Close to High			
19 Oct 1987	-20%	-20%	36.4	313%	n/a	157%	n/a	n/a	n/a	* Black Monday
5 Feb 2018	-4%	-4%	17.3	116%	124%	95%	96%	0.82	4.4	Fed fears + Short squeeze
24 Aug 2015	-4%	-5%	28.0	45%	90%	25%	53%	0.55	4.2	China selloff
27 Feb 2007	-3%	-4%	11.2	64%	70%	25%	40%	0.39	1.8	China selloff
6 May 2010	-3%	-9%	24.9	32%	63%	17%	36%	0.54	4.0	Flash crash
28 Oct 1997	5%	-2%	31.1	0%	56%	1%	32%	n/a	n/a	* Asian Crisis
24 Jun 2016	-4%	-4%	17.3	49%	52%	33%	37%	0.67	3.4	Brexit
15 Nov 1991	-4%	-4%	14.0	52%	n/a	28%	n/a	0.54	n/a	* Japan selloff
23 Jul 1990	-2%	-3%	15.6	52%	n/a	28%	n/a	0.54	n/a	* ???
29 Jun 2017	-1%	-1%	10.0	14%	51%	2%	28%	0.14	2.9	Sector rotation
8 Aug 2011	-7%	-7%	32.0	50%	50%	19%	19%	0.38	2.7	US Downgrade
?	?	?	?	?	?	?	?	?	?	?
29 Sep 2008	-9%	-9%	34.7	34%	39%	14%	22%	0.41	4.7	Credit Crisis

* VIS Synthetic based on modeled projection

** Volume Spike = Current Volume / Prior 6mth ADV

⌘ Feb 2018 Event: while prior shocks were rather in the price space, with the growth of VIX futures products and increased bet sizes, the risk of flash crashes and short squeezes in the VIX Futures space has grown.

Risk Heat Map

⌘ Extreme Event Assumptions

- Knock-out Gap (once in 30yr+ event):

⌘ VIX Synthetic: +125%, which is roughly between estimated 1987 and 2018 spikes.

⌘ Commodity: +40%, which is more than double 30-yr max.

- Liquidity:

⌘ VIX: able to cover 25% of ADV: TAS is typically 10-15% of ADV on top of ADV, and 10-20% of ADV is traded in the last 30-60min. Adverse move is specifically for 15% vol regime, +35% relative move. More general VIX framework looks at every multi-day vol regime.

⌘ Commodity: able to cover 20% of ADV with less proxy hedges than VIX, residual risk is shocked by max 1-day move.

	Exposure	Probability Of Adverse Event	Event	Extreme Event P&L loss	30-year CRev	Hedgeability	VaR/Scen./ Sensitivity Capture	Comments
Market Risk								
Linear net exposure	~Zero	n/a		~\$0		High	Captured	
Payoff convexity	Low	Low		~\$0		High	Captured	With the exception of small unlevered covered call ETNs
Knock-out Gap (1-day)								
Low-vol/Low-lvrg (EQ)	Minimal	~Zero	Spot -40%	~\$0		Medium	Captured	
High-vol/High-Lvrg (VIX)	High	Once in ~30yr+	VIX Synth +125%	-\$100m	300m	Low	Captured	Assuming Avg AUM ~500m, of which XIV ~400m
High-vol/High-Lvrg (CM)	High	Once in ~30yr+	Spot +40%	-\$20m	500m	Low	Missing	Assuming Avg AUM 1.3bn, of which DGAZ ~100m
Liquidity Risk								
Unlevered ETNs	Low	Low		~\$0		High	n/a	
Levered ETNs (EQ Price)	Low	Low		~\$0		High	n/a	
Levered ETNs (VIX)	High	Once in ~30yr		-\$25m		High	n/a	Assuming worst-case XIV 55m Vega rebalancing, 200m Vega ADV
Levered ETNs (CM Price)	Medium	Once in ~30yr		-\$15m		Medium	n/a	Assuming worst-case Nat Gas 900m Delta rebalancing, 4bn Nat Gas ADV
Credit Risk								
	"Low"	"Low"		n/a		n/a	Captured	In scope for PRA IRC
Reputational Risk								
	Low	Low		Low		High	n/a	"Hedges" relate to compliance, legal, docs.

Liquidity Details: Largest ETNs

- VIX and Gas ETN's have been the riskiest positions in terms of product size relative to market, potential adverse events, and severity of events.
- However, liquidity has been sufficient to cover hedge rebalancing under peak usages and worst-case scenarios.

Fig 1. Largest ETN's \$M

	ETN Group	Underlying	Lvrg	Max Delta/Vega	Max 1d Gap *	Worst-Case Rebalancing			ADV	% of ADV	Comments
						Creation / Redemption	Leverage	MAX			
Commodity	UGAZ+DGAZ	Natural Gas	+/-3	3,507	15%	701	898	898	5,286	17%	
	UWTI+DWTI	Crude Oil	+/-3	4,197	15%	839	1,999	1,999	32,679	6%	Delisted
FX	UGLD+DGLD	Gold	+/-3	364	10%	73	146	146	20,762	1%	
	USLV+DSL	Silver	+/-3	1,041	20%	208	431	431	4,880	9%	
Equity Price	FIEU	SX 5E	+2	635	13%	127	83	127	1,101,635	0%	
	FLGE	Russell 1000	+2	3,666	12%	733	440	733	477,394	0%	
	MLPN	MLP Index	+1	962	22%	192	-	192	16,733	1%	Retired
Equity Vol	XIV+TVIX+VIIX	VIX Fut	-1/+2/+1	87	35%	17	55	55	200	28%	Retired

* 2008-2017

** VIX ETN's are covered separately with a more detailed vol-regime-based analysis

Fig 2. UGAZ+DGAZ CM Delta (Absolute) \$Bn

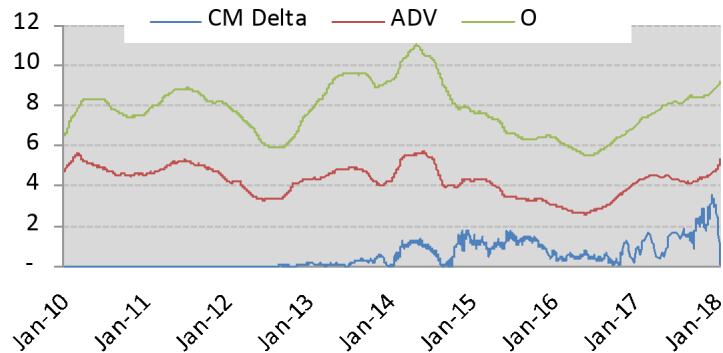
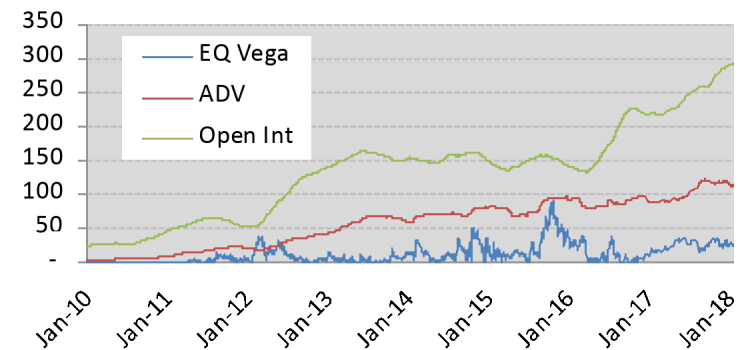


Fig 3. XIV+TVIX+VIIX EQ Vega (Absolute) \$M



Risk Capture Issues

⌘ **Commodity ETN Gap Risk:**

- Commodity ETN's are the only group of ETN's where gap risk hasn't been captured until Nov 2017.
- Legacy reasons:
 - ⌘ At inception it was agreed not to decompose ETN delta to underlying Commodity futures.
 - ⌘ Equity systems at the time, and Giraffe currently did not have infrastructure set up to decompose Commodity ETNs.
- Remediation:
 - ⌘ In Nov 2017, tactical solution has been implemented in FO RMS to capture Commodity gap risk.
 - ⌘ Q1 of 2018 is the target delivery of strategic solution for Commodity ETNs.

Part 2. Appendix A: Leverage Gamma

- No standard measure of Leverage gamma.
- Leverage is always adverse for $Lvrg < 0$ or $Lvrg > 1$.
- **Quantification:**
 - **Price impact:**
 - Assume underlying index goes up & down returning to the same level,
 - Then 2-day % return = $(1 + r) \cdot \left(\frac{1}{1+r}\right) - 1$
 - With leverage: $(1 + Lr) \cdot \left(1 + L \cdot \left(\frac{1}{1+r} - 1\right)\right) = Lr^2 \frac{1-L}{1+r}$ → Always a loss for $L < 0$ or $L > 1$
 - **Hedge rebalancing impact:**
 - Rebalancing delta need = $Notional_0 \cdot L \cdot r \cdot (L - 1)$ → Wrong-way rebalancing for $L < 0$ or $L > 1$
 - If $r > 0$, then need to buy into rally for $L < 0$ or $L > 1$
 - If $r < 0$, then need to sell into selloff for $L < 0$ or $L > 1$

Part 3

Flag Framework

Summary

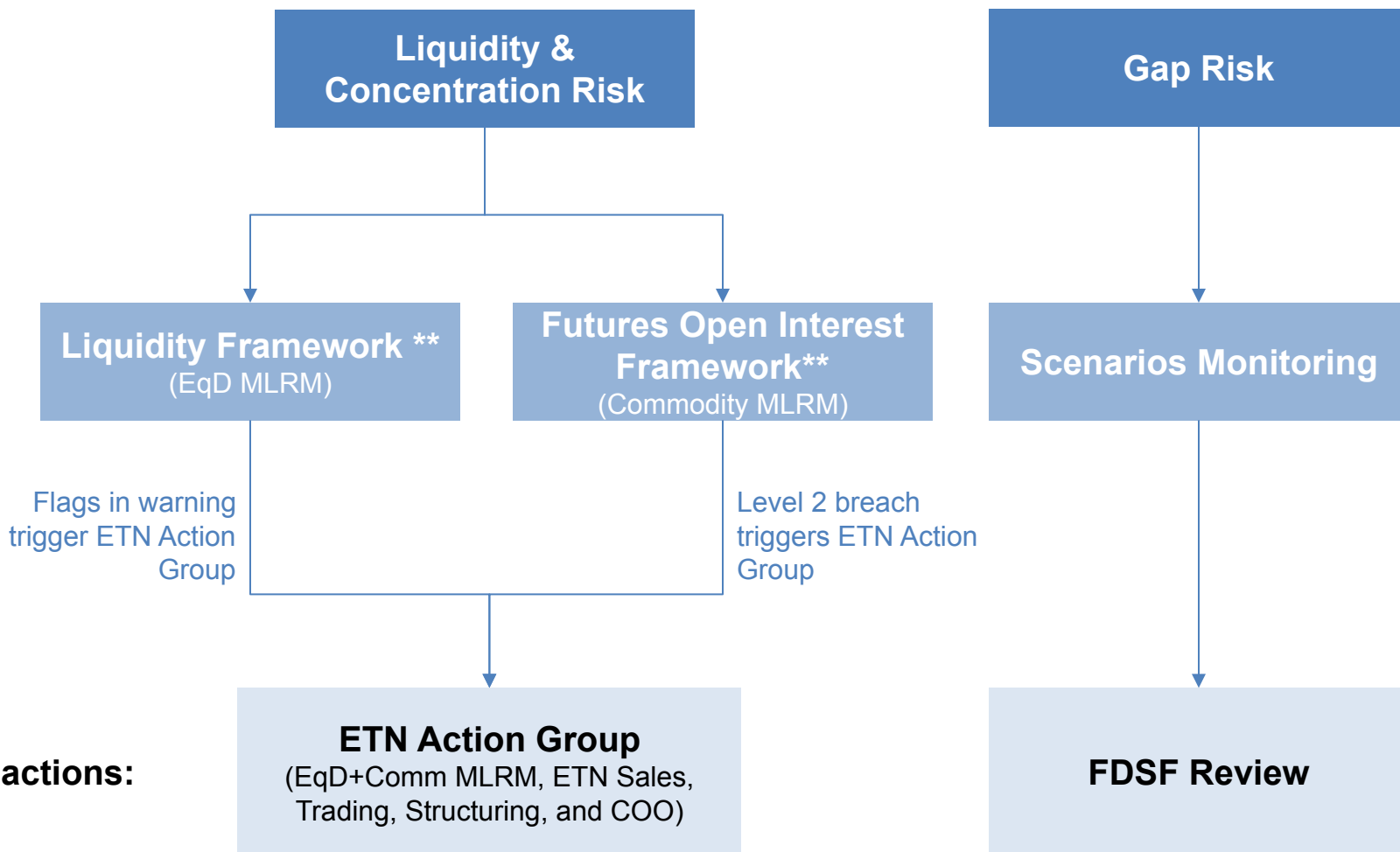
- ⌘ ETNs are one of key products issued by CS, acting as a source of both revenue and funding, as well as driving the increase in liquidity of the underlying instruments.
- ⌘ As the range of underlying instruments is expanding and exposure is growing, it's important to implement a comprehensive control framework that would capture all key risks as well as be tractable and easy to maintain on a frequent basis.
- ⌘ **Key Risks:**
 - **Liquidity & Concentration:** ETN linearity, leverage, and close-to-close payoff mean that the main risk is having sufficient liquidity to rebalance hedges without materially impacting the market. Liquidity & concentration exposure arises from 3 main sources:
 - 1) Creation/redemption
 - 2) Full unwind via early issuer call or expiry
 - 3) Rebalancing due to leverage and market moves
 - **Gap risk:** leverage introduces gap exposure due to ETNs being floored at Zero, while linear hedges are unfloored.
- ⌘ **Controls:** risk is controlled via 3 main approaches:
 - Liquidity & Concentration:
 - ⌘ Liquidity-based Framework
 - ⌘ Open Interest-based Framework (for futures)
 - Gap risk:
 - ⌘ Scenarios
- ⌘ **Note:**
 - Liquidity and Open Interest-based frameworks are run in parallel by EqD and Commodity clusters MLRM respectively (see Appendix E for the relationship of Volume-based and Open-Interest-based approaches).
 - Breach of both warning levels trigger ETN Action Group.

Control Framework Diagram

Key Risks:

Control:

Review and actions:



** See Appendix E for the relationship of Volume-based and Open-Interest-based approaches.

Key Risks: Liquidity & Concentration

3 main sources of liquidity & concentration risks are outlined below, and further details/analysis follow.

1) Creation / redemption

- **Risk:** daily orders to create / redeem ETNs result in a need to rebalance offsetting hedges on a daily basis. A sufficiently large order consequently could result in the desk affecting a market or remaining unhedged and exposed.
- **Mitigants:**
 - Creations/redemptions client flow provides additional right-way liquidity, i.e. clients tend to sell on rallies, and buy on selloff (see Appendix C for analysis).
 - While historically daily creations/redemptions never exceeded 10% of ADV, flag calibration assumes a conservative 20% of ADV rebalancing (see Calibration Part 1 for details).

2) Full unwind via early issuer call or expiry

- **Risk:**
 - In case of early issuer call or final expiry, all hedges need to be unwound over a short period of time.
 - Additionally, a number of ETNs do not currently have averaging at expiry, which needs to be discussed.
- **Mitigants:**
 - Majority of ETNs have a 5-day averaging period for early issuer call, and half of ETNs do for final expiry.
 - All new ETN approvals require multi-day averaging period for early call and final expiry.

3) Rebalancing due to leverage and market moves

- **Risk:** presence of leverage and close-to-close payoff mean that hedges need to be rebalanced whenever markets move. Large gaps and higher leverage in particular pose greater risks.
- **Mitigants:**
 - Worst-case rebalancing under an adverse gap move is incorporated and constrained by the proposed Flag framework (see Calibration Part 2 further below).
 - Liquidity tends to increase on days of large gaps (see Appendix B for analysis).
 - Additional right-way / wrong-way effects provide sufficient comfort in desk's ability to hedge even in more stressed environments (see Appendix C for analysis)

Gap Risk & Open Interest Framework

⌘ Gap Risk:

- While gap risk is real but extremely remote, the most feasible and rational way to control it is via notional control, which Liquidity and Open Interest frameworks already do.
- **Hedging limitations are:**
 - ⌘ Gap risk is practically unhedgeable due to limited availability of instruments and lack of sufficient size of such instruments. E.g. gap options on VIX futures for XIV ETN or gap options for Natural Gas.
 - ⌘ If proxy hedges are utilized, the costs far exceed the benefits, and positive hedge payoff is not guaranteed at best, and is unlikely otherwise if such a gap event occurs (a separate more detailed 30-year analysis was done for XIV ETN).
- **Proposal:**
 - ⌘ We propose to monitor scenarios without limits as they don't achieve anything without ability to hedge.
 - ⌘ Riskiest ETNs with a potential gap exposure should be analyzed in more detail for the likelihood and severity of potential loss, and a corresponding loss appetite should be incorporated into notional flags.

⌘ Open Interest Framework

- For commodity futures, Commodity MLRM has implemented a separate flag framework:
 - ⌘ 2-tiered levels
 - ⌘ Open interest monitored per contract, per exchange.

Liquidity Framework

- 8 General basis for liquidity-based control is that maximum daily rebalancing should not exceed **30%** of average daily volume (ADV) of the hedging instrument. And on normal days, **20%** of ADV is used for calibration (see Appendix A for ADV specifications).

*** Important to distinguish that flags are on **Total Outstanding Delta** in hedge delta terms, while calibration is based on **Daily Rebalancing amount** of 20-30% of ADV. Both “Outstanding Delta” or “Daily Rebalancing Amount” can be used equivalently for calculating flags, but I propose “Outstanding Delta” as it is a more direct representation of the overall size of the business and size of outstanding hedges.

- 8 Final risk appetite will be the **most constraining of** that implied from 3 sources of rebalancing:
 - 1) Creation/redemption
 - 2) Full unwind via early call or expiry
 - 3) Rebalancing due to leverage and market moves
- 8 Given that ETNs are exchange-traded with broad retail and institutional client base, to minimize reputational risk CS will aim to proactively manage potential growth and dynamics of the products. Hence **2-tiered** framework is suggested analogous to limits and limit warnings. A detailed calibration is discussed in subsequent slides.
 - **Dynamic Flag:** **100% of ADV** with risk-adjusted usage to reflect most constraining risk appetite from 3 sources of rebalancing above.
 - ☐ FO must aim to remain below this level.
 - **Flag Warning:** **70%** of the flag. Within 5 business days, ETN Action Group must determine further course of action (see following slides for possible courses of action).
 - **Discretionary cap:** while for certain ETNs very large ADV can imply outsize liquidity-based Flags, e.g. Crude Oil ETNs, MLRM and FO may determine to cap the flag at a discretionary level depending on market and business outlook and conditions.
- 8 **ETN Action group** includes: EqD MLRM, Commodity MLRM where applicable, ETN Sales, Trading, Structuring, and COO.

- 8 The VelocityShares ETNs were developed and launched in partnership with VelocityShares (“VLS”) and these ETNs represent an important VLS revenue stream. VLS is now part of Janus Henderson, a KAM client of CS. As such, we should expect that

Flags in warning: Possible Courses of Action

Strategy	Details	Limitations, drawbacks and/or considerations
1) Re-evaluate Flags	<ul style="list-style-type: none"> Determine whether current market factors justify raising the Flags. 	<ul style="list-style-type: none"> Negligible since other courses of action remain available.
2) Increase ETN Creation Fee	<ul style="list-style-type: none"> Our current offering documents allow CS to raise the creation fee from current 5bps to 15bps per ETN 	<ul style="list-style-type: none"> Increasing the creation fee will likely result in a wider bid/ask spread in the secondary market, thus increasing the cost of purchasing the ETNs. If there are no competing or alternative ETNs or ETFs currently available, it's unclear what impact this action would have on dissuading investors from purchasing the ETNs.
3) Reduce Frequency of ETN Creations	<ul style="list-style-type: none"> Replace current daily creations/purchases with creations that occur less frequently (e.g., 1, 2 or 3 times per week). 	<ul style="list-style-type: none"> Will this constraint on ETN supply result in the ETNs trading at a premium in the secondary market? Requires issuance of a press release
4) ETN vs. ETN IV TRS with CS	<ul style="list-style-type: none"> Introduce an ETN creation process that requires the creating party to enter into a [3 or 6]-month "ETN vs. ETN IV" total return swap ("TRS") with CS. The capital and collateral requirements of a TRS shrinks the pool of counterparties that would be eligible to create ETNs. The TRS also has the effect of providing CS with a perfect hedge for any ETNs that are created/issued in this manner, thus eliminating the need to trade any natural gas futures contracts during the term of the TRS. This strategy has been effective in managing the sizes of the TVIX and XIV ETNs and reducing the number of VIX futures CS needs to trade during the terms of the TRSs. 	<ul style="list-style-type: none"> This constraint on ETN supply may result in the ETNs trading at a premium in the secondary market. IOSCO requirements result in additional costs. Natural gas futures contracts will need to be traded when TRS expires if corresponding ETNs are still outstanding. Requires issuance of a press release. Will likely result in negative media coverage and regulatory scrutiny, especially if the ETNs trading at a premium in the secondary market.

Flags in warning: Possible Courses of Action (Cont-

d) Strategy	Details	Limitations, drawbacks and/or considerations
5) Sourcing Hedge on unfloored Index or ETN IV from Third Parties	<ul style="list-style-type: none"> CS traders can enter into one or more TRSs on the Index with third parties to hedge a portion of CS's ETN exposure. Eliminates the need to trade any natural gas futures contracts represented by the TRSs. In case of ETN IV, provides CS with a perfect hedge for any ETNs risk managed by such TRSs. 	<ul style="list-style-type: none"> IOSCO requirements result in additional costs. The TRS will have a fixed term (e.g., 1 year), thus greatly reducing the flexibility CS traders have in managing their hedge position. Such TRSs will result in considerable additional costs.
6) Buying back ETNs in the market	<ul style="list-style-type: none"> CS trader can proactively buy back ETNs in the listed market upon compliance approval. They can then use those notes to satisfy client demand. 	<ul style="list-style-type: none"> Requires compliance approval For Non-Equity ETNs, requires proper coordination between ETN Trader and Non-Equity hedge provider. Alternatively, ETN trader may execute non-Equity hedges subject to Trader Mandate limitations.
7) Capping Future ETN Creations	<ul style="list-style-type: none"> Announcing to the public by way of a press release that further issuances of an ETN have been capped (i.e., no new ETNs will be issued). 	<ul style="list-style-type: none"> This constraint on ETN supply will very likely result in the ETNs trading at a premium in the secondary market. Requires issuance of a press release. Will almost certainly result in negative media coverage and likely regulatory scrutiny, especially if the ETNs trading at a premium in the secondary market. Negative knock-on effect on remaining CS ETN platform.
8) Delisting ETNs	<ul style="list-style-type: none"> Announcing to the public by way of a press release that ETNs will be delisted from primary exchange (e.g., UWTI/DWTI in Q4 2017). 	<ul style="list-style-type: none"> Requires issuance of a press release. Based on UWTI/DWTI experience, will result in considerable negative media coverage and regulatory scrutiny. Negative knock-on effect on remaining CS ETN platform.

Liquidity Flags Proposal

8 Select largest ETN Flag proposals:

\$Billions , as of 28-Nov-17

Asset Class	ETN	Underlying Instrument	Historical Max Usage	Current Usage	70% Flag Warning	Dynamic Flag	Usage %	ADV	Comment
Equity	FLGE	Russell 1000 Growth	3.1	3.1	7.0	10.0	31%	>100	Discretionary cap at \$10bn
	FIEU	EuroStoxx 50	0.6	0.5	4.6	10.0	5%	>100	Discretionary cap at \$10bn
Comdty	UWTI + DWTI**	WTI Crude Oil	4.6	0.6	7.0	10.0	6%	36.3	Discretionary cap at \$10bn
	UGAZ + DGAZ	Natural Gas	2.9	2.9	3.1	4.7	62%	4.7	
	UGLD + DGLD	Gold	0.4	0.3	7.0	10.0	3%	19.6	Discretionary cap at \$10bn
	USLV + DSLV	Silver	1.1	1.0	2.2	4.2	23%	4.3	

Final usage is a greater of:

Asset Class	ETN	Actual Delta
Equity	FLGE	3.1
	FIEU	0.5
Commodity	UWTI + DWTI**	0.4
	UGAZ + DGAZ	2.9
	UGLD + DGLD	0.3
	USLV + DSLV	0.7

1. Implied from Creations/redemptions

Delta
3.1
0.5
0.4
2.9
0.3
0.7

2. Implied from Full Unwind

Delta
3.1
0.5
0.4
2.9
0.3
0.7

3. Implied from Levered Rebalancing

Leverage-adj. Delta
1.2
0.2
0.6
2.1
0.3
1.0

**** Note:** WTI ETNs have been delisted and Brent Crude ETNs have been listed instead, however current Brent ETN issuance is <\$1m.

Flag Calibration: 1) Creation / Redemption

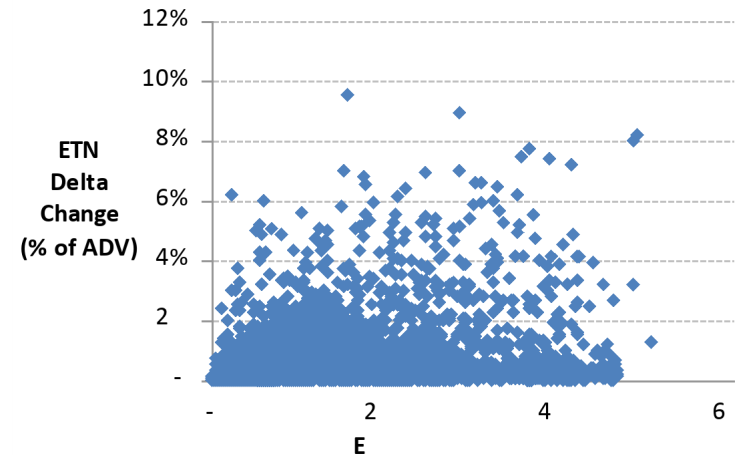
⌘ **Goal:** assess worst-case size of potential daily creation/redemption for the 1st source of liquidity exposure.

⌘ **Conclusions:**

– **Empirical results:**

- ⌘ A **100% of ADV** maximum flag on “Total Outstanding Delta” will result in worst-case 20% of ADV rebalancing on any given day.
- ⌘ **[Figure 1]:** Historically, as ETNs grew larger in size relative to ADV, daily creations / redemptions remained persistently <10% of ADV. This is consistent with expected client dynamics: as ETN grows in size => customer base become broader and more dispersed.
- ⌘ We assume conservatively that up to 20% of ADV, i.e. 2x historical max, would be the worst case daily creation/redemption. This coupled with a 20% of ADV comfort level for normal days, implies a 100% of ADV maximum flag on “Total Outstanding Delta”.
- ⌘ Conservative assumption is needed due to absence of limits on daily creations / redemptions:
 - Currently, creations are not capped, however FO is exploring ways to limit them.
 - Redemptions are never limited given the clients’ daily redemption legal right.
- **Right-way Client Liquidity Flow:**
 - ⌘ Creations / redemptions client flow also provides additional right-way liquidity, i.e. clients tend to sell on rallies, and buy on selloff (see Appendix C for analysis). This provides a further comfort that the desk will have sufficient liquidity to rebalance.

Figure 1.



– **Analysis Assumptions:**

- ⌘ 2010-2016 period
- ⌘ Population: 10 major ETNs (2 equity + 8 non-equity), including the most volatile Gas and Silver.
- ⌘ All numbers are relative % so that all ETNs can be aggregated in 1 figure.

Flag Calibration: 2) Full unwind via early call or expiry

- 8 Last and less common source of liquidity risk is unwinding of all hedges in an orderly fashion due to early issuer call or expiration.
- 8 **Goal:** incorporate full unwind scenario into flag calibration.
- 8 **Conclusions:**
 - Similarly to 1st part of the calibration, a **100% of ADV** maximum flag on “Total Outstanding Delta” will result in a 20% of ADV unwind per day due to the following:
 - **[Figure 1]:** To mitigate this risk, majority of ETNs are contractually unwound over a period of time, i.e. 5 days for most ETNs.
 - Again, coupled with a 20% of ADV comfort level on a normal day, this implies a 100% of ADV Maximum Flag on “Total Outstanding Delta”.
- 8 **Additional Considerations:**
 - VIX ETNs with 1-day early unwind period are controlled through a separate VIX ETN framework.
 - Further follow-up is needed on a number of ETNs with 1-day final maturity period.

Figure 1: Unwind Periods

Ticker	Early Call	Maturity
AMJL	5 days	5 days
DGAZ	5 days	1 day
DGLD	5 days	1 day
DSLX	5 days	1 day
DWTI	5 days	1 day
FIEU	5 days	5 days
FLGE	5 days	5 days
GLDI	5 days	5 days
MLPO	5 days	5 days
MLTI	5 days	5 days
OIIL	5 days	5 days
REML	5 days	5 days
SLVO	5 days	5 days
TVIX	1 day	1 day
TVIZ	1 day	1 day
UGAZ	5 days	1 day
UGLD	5 days	1 day
USLV	5 days	1 day
USOI	5 days	5 days
UWTI	5 days	1 day
VIIX	1 day	1 day
VIIZ	1 day	1 day
XIV	1 day	1 day
ZIV	1 day	1 day

Flag Calibration: 3) Rebalancing due to leverage

- Presence of leverage and close-to-close payoff mean that hedges need to be rebalanced whenever markets move. Large gaps and higher leverage in particular pose higher risks.
- **Goal:** capture leveraged rebalancing risk given worst-case 1-day gap and leverage factor.
- **Conclusions:**
 - Capturing of leverage gamma can be reflected in either Flag or Usage, to which risk framework is agnostic mathematically.
 - I propose to reflect it in usage which will allow to have simpler and more coherent set of flags across all ETNs and sources of risk.
 - Define Usage = “**Leverage-adjusted Delta**” which captures leverage and market severity:
$$\frac{[Delta] \cdot [Max\ 1day\ Move] \cdot [Lvrg - 1]}{30\%}$$
 - This metric means that if Usage = 100% x ADV, then “Daily Rebalancing Amount” will equal to 30% x ADV.
 - It allows to define the flag as **100% of ADV**, consistent with 1st and 2nd parts of calibration, while usage will be leverage-adjusted.
- **Example:** assume fixed **\$3bn** outstanding delta and **\$3bn flag**:
 - [Figure 1]: Daily rebalance amount increases with leverage and Max 1day move. Additionally, -3x Gamma is twice as larger than 3x.
 - [Figure 2]: Leverage-adjusted Delta increases accordingly with higher risk and results in tighter appetite given same \$3bn flag.

Figure 1: Daily Rebalancing Amount

		Max 1-day Move		
		10%	15%	20%
Lvrg	3	600	900	1,200
	2	300	450	600
	-3	-1,200	-1,800	-2,400



Figure 2: Leverage-adjusted Delta

		Max 1-day Move		
		10%	15%	20%
Lvrg	3	2,000	3,000	4,000
	2	1,000	1,500	2,000
	-3	-4,000	-6,000	-8,000

Values in red would be at or in excess of flag

- **Additional considerations** to allow up to 30% of ADV rebalancing assumption for days with worst-case gap moves:
 - We take into consideration that volumes tend to increase on large gap moves (see Appendix B).
 - Additional 4 liquidity effects provide sufficient comfort in desk's ability to hedge even in more stressed environments (see Appendix C).

Flag Calibration: 3) Rebalancing due to leverage (Cont-d)

Additional advantage of “Leverage-adjusted Delta” is a single comprehensive framework that captures all leverages and combinations of different leverages into 1 metric:

– **Example 1:**

- CS issues **\$1bn AUM** of both UGAZ (+3x) and DGAZ (-3x), i.e. **-\$3bn delta** for UGAZ and **+\$3bn delta** for DGAZ
- Then both net ETN Delta and required hedges equal to **Zero**.
- However “Daily Rebalancing Amount” for combined position will be **\$2.7bn** and “Leverage-adjusted Delta” will be **\$9bn!**

– **Example 2:** following is a reverse example of different combinations of +3x and -3x leverages given ADV and 30% of ADV maximum rebalancing:

- Assume **\$3bn ADV and Flag**.
- This implies **\$0.9bn** maximum rebalancing per day.
- As -3x leverage has twice as large leverage gamma, 30% of ADV cap implies \$3bn Max Delta for +3x leverage, but only \$1.5bn Max Delta for -3x leverage:

Daily Rebalancing given 15% move				Max Outstanding Delta			Max Leverage-adj Delta		
3x	-3x	TOTAL	% of ADV	3x	-3x	TOTAL	3x	-3x	TOTAL
-900	-	-900	30%	-3,000	-	-3,000	-3,000	-	-3,000
-800	-100	-900	30%	-2,667	167	-2,500	-2,667	-333	-3,000
-700	-200	-900	30%	-2,333	333	-2,000	-2,333	-667	-3,000
-600	-300	-900	30%	-2,000	500	-1,500	-2,000	-1,000	-3,000
-500	-400	-900	30%	-1,667	667	-1,000	-1,667	-1,333	-3,000
-400	-500	-900	30%	-1,333	833	-500	-1,333	-1,667	-3,000
-300	-600	-900	30%	-1,000	1,000	-	-1,000	-2,000	-3,000
-200	-700	-900	30%	-667	1,167	500	-667	-2,333	-3,000
-100	-800	-900	30%	-333	1,333	1,000	-333	-2,667	-3,000
-	-900	-900	30%	-	1,500	1,500	-	-3,000	-3,000

Appendix A: Average Daily Volume Specification

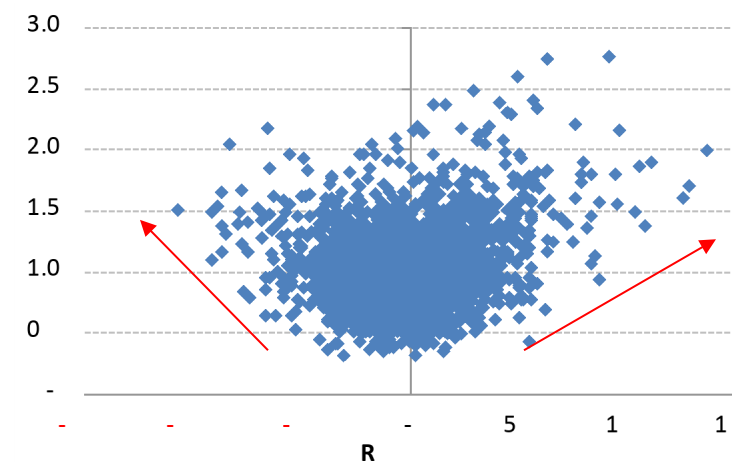
- ADV is measured as 6-mth average, Max of 1st and 2nd futures given that on any given day ETN holds a basket of 1st and 2nd futures (with the exception of the monthly expiries). This is more conservative than a sum of 1st and 2nd Futures' volume that would be more comparable to a basket of 1st and 2nd futures excluding days near monthly expiries.
- While entire daily volume can't be attributable to the ETN hedging period, we keep in mind that the desk has TAS market at its disposal for hedging in addition to regular ADV.

Appendix B: Volume on large market move days

- Define "Volume Ratio" = $\frac{1\text{-day Volume}}{\text{Prior 3mth ADV}}$
- Volumes tend to increase on large market move days, and by ~50% for largest moves:

Natural Gas

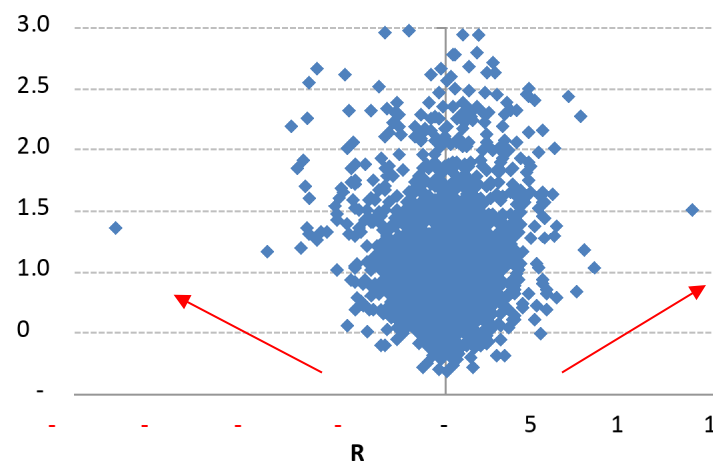
Volume Ratio



(2009-2017 data)

Silver

Volume Ratio



Appendix C: Right-way / Wrong-way Liquidity

Conclusion: We can be fairly more **comfortable** with FO's ability to hedge even in more stressed environments given increased liquidity from market participants and right-way risk more than offsetting wrong-way short leverage gamma as illustrated with Beta of -1.41 in **[Figure 2]**.

ETN Business affects liquidity in 4 ways:

- 1) **General increase in liquidity: Positive:** Historical observations of ETN business across a wide range of assets have shown a common increase in the liquidity of the underlying asset.
- 2) **Rebalancing due to leverage: Wrong-way:** for all levered ETNs, CS is short leverage gamma or has wrong-way exposure, i.e. CS has to buy hedges in a rallying market and sell hedges in a decreasing market.
- 3) **Issuance / Redemption: Right-way:** over the last several years, FO has seen a persistent right-way activity from the clients, i.e. issuance increases in decreasing markets and redemptions increase in rallies **[Figure 1]**. Same patterns exist across other ETNs as well.
- 4) **Market positioning** based on publicly available information: **Generally benign** for hedging purposes:
 - ⌘ As market participants anticipate ETN Issuers' rebalancing during settlement period, they execute trades in the same direction as CS but ahead of the time during the day.
 - ⌘ During the actual settlement, i.e. during the last few minutes before close, market participants close out their trades providing liquidity to CS. This activity compounds the market moves during the day, but actually improves liquidity during the settlement period.

Figure 1: UGAZ Shares % Chg vs Weekly Return

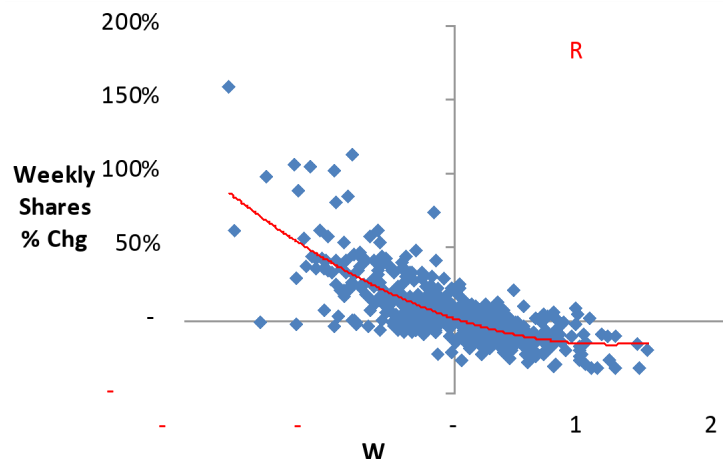
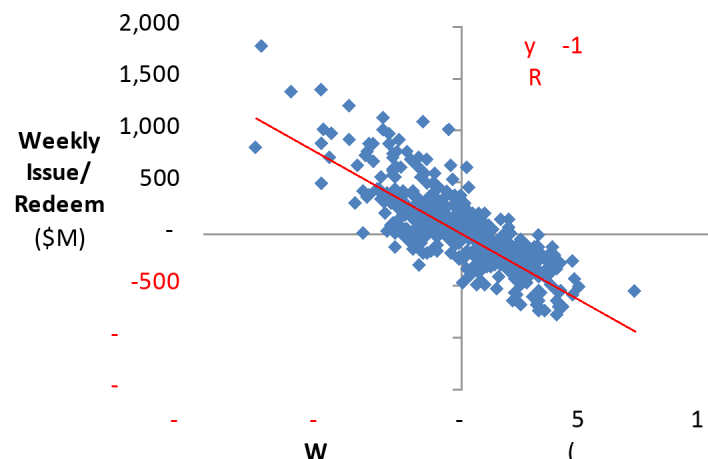
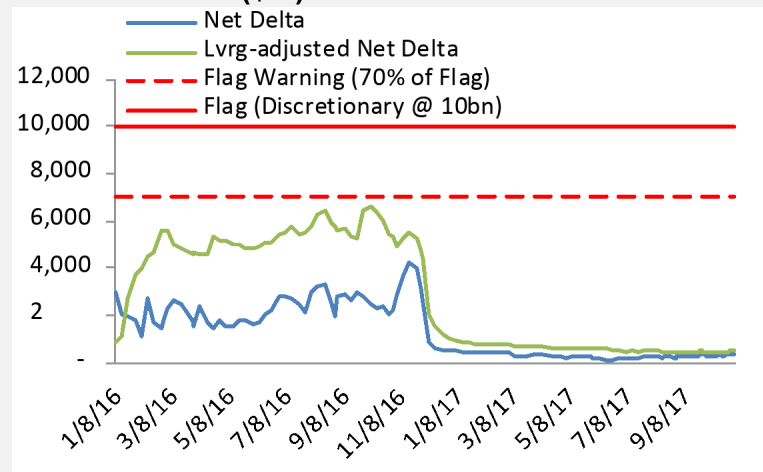


Figure 2: UGAZ Issuance/Redemption vs Levered Rebalancing

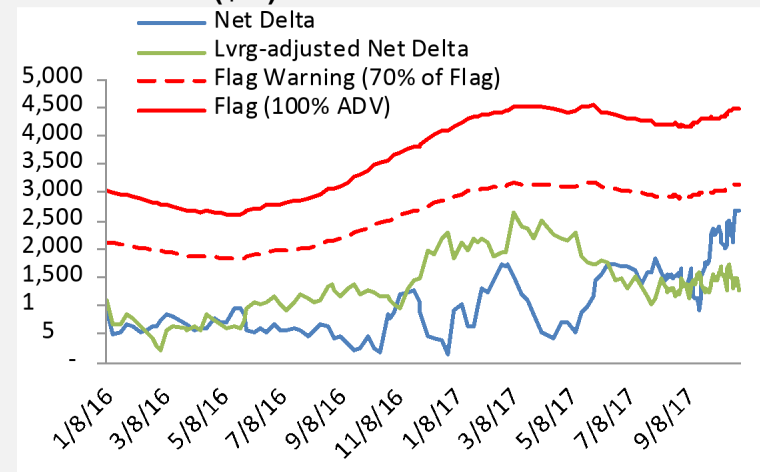


Appendix D: Historical Usage

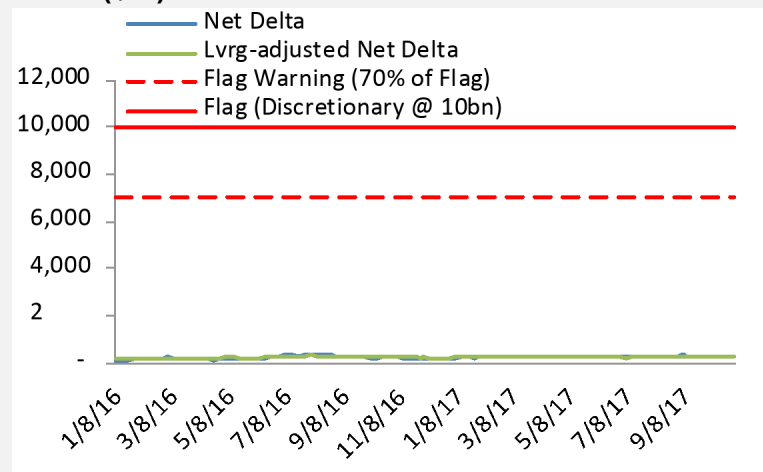
WTI Crude Oil (\$M)



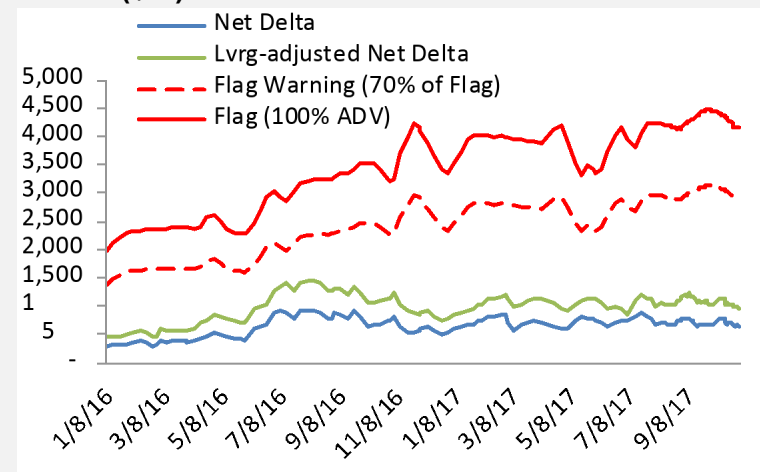
Natural Gas (\$M)



Gold (\$M)



Silver (\$M)



Appendix E: Volume vs Open Interest

⌘ Important to note:

- Both Volume-based and Open Interest-based controls are relevant for Liquidity and Concentration risk, hence they are run in parallel.
- Either metric can be more constraining than the other depending on contract, client base, and market conditions.
- E.g.:
 - ⌘ Silver Open Interest is **3x** larger than Volume, hence Volume would be more constraining.
 - ⌘ WTI Crude Open Interest is **0.9x** of Volume, hence Open Interest would be more constraining

of Contracts, Max of 1st and 2nd Futures

	Open Interest	Avg Daily Volume	Ratio: Open Int / Volume
Aluminum	100,030	26,115	3.8
Brent Crude	669,688	290,294	2.3
Coffee	119,703	15,035	8.0
Copper	161,371	49,979	3.2
Corn	762,117	129,762	5.9
Cotton	112,332	9,155	12.3
Feeder Cattle	26,001	4,855	5.4
Gold	380,323	151,152	2.5
Heating Oil	132,576	51,485	2.6
Natural Gas	312,124	147,958	2.1
Nickel	30,756	9,255	3.3
RBOB Gasoline	156,634	67,262	2.3
Silver	141,404	47,170	3.0
Soybean Meal	133,552	25,130	5.3
Soybean Oil	152,947	30,674	5.0
Soybeans	301,596	69,678	4.3
Sugar	431,456	56,043	7.7
Wheat	275,670	52,727	5.2
WTI Crude Oil	597,839	666,454	0.9
Zinc	53,789	13,196	4.1

Appendix F: ETN Weekly Report

Part 4

ZIV Analysis



MLRM

ZIV Notional Flag Review

Jan 2018

Equity Derivatives, Elena Rodger
January 2018

Notional Flag Framework Review

Proposal:

- 8 To review current Notional Flag for ZIV (inverse mid term VIX ETNS) vs most recent volumes of VIX Futures to include 2016/2017 data set increase Notional Flag from -\$150m to -\$300m
- 8 Notional Flag to TVIZ (twice leverage mid term VIX ETN) remains unchanged

Key risk considerations:

Both ZIV and TVIZ show convexity in vega exposure as a result of compounding nature of the product. Backtesting shows that in periods of high volatility daily rebalancing required and/or total amount of the product may take significant portion of the available liquidity and/or be above CS risk appetite.

- 8 Backtesting using worse 10 day historical path up and down from 2007 in the each vol regime shows that:
 - max 1 day rebalance can be -\$5m, which is 20% of the ADV in 2016 and 16% of ADV in 2017
 - total vega on the product can get to +\$23m, if we have \$300m of ZIV and no offsetting position in TVIZ, which is 32% of the '16 Open Interest and 22% of '17 Open Interest

in \$m	Proposed Jan'18			10 day historical path (Up and Down) for max utilisation of both Flags			10 day historical path (Up and Down) for \$300m in ZIV and \$0 in TVIZ		
VIX mid term	TVIZ	ZIV in \$(m)	TOTAL in \$(m)	Max 1 day	% of 2016 ADV (\$21m)	% of 2017 ADV (\$26m)	Vega growth (down)	% of 2016 OI (\$70m)	% of 2017 OI (\$101m)
0-15	-50	-300	-350	-3/2	-10%/5%	-8%/4%	from 21 to 23	from 29% to 32%	from 20% to 22%
15-20	-50	-300	-350	-5/3	-20%/13%	-16%/11%	from 16 to 21	from 23% to 29%	from 16% to 20%
20-30	-50	-300	-350	-3/3	-10%/11%	-8%/9%	from 12 to 17	from 17% to 24%	from 11% to 16%
30-45	-50	-300	-350	-2/3	-8%/11%	-6%/9%	from 12 to 17	from 17% to 24%	from 11% to 16%
45+	-50	-300	-350	-1/-1	-3%/-3%	-3%/-3%	from 13 to 13	from 18% to 18%	from 12% to 12%

VIX Future Volumes and Moves

“Mid Term VIX Future Price and Volumes” graph

- ⌘ Average Volumes traded across 4th to 7th VIX Future has been trending up
- ⌘ Average ADV in 2016-2017 has been approximately \$23m in vega terms
- ⌘ Average Open interest in 2016-2017 has been approximately \$85m in vega terms across 4th to 7th VIX Futures

“2016-2017: Total 4th – 7th VIX Future ADV vs average daily move” graph

- ⌘ Volumes of VIX futures increase with larger move in underlying VIX Futures

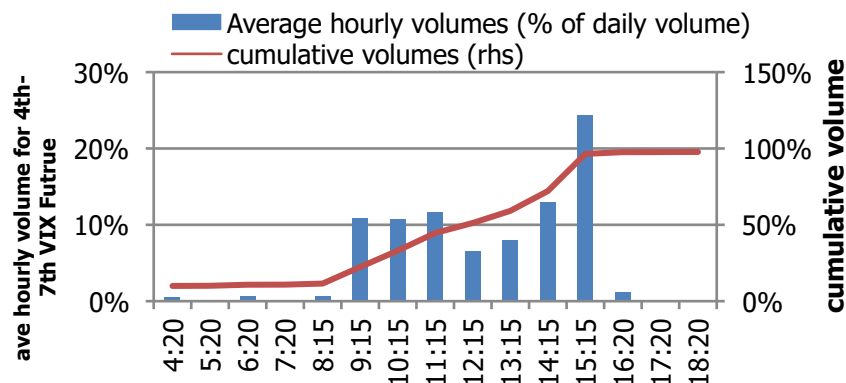
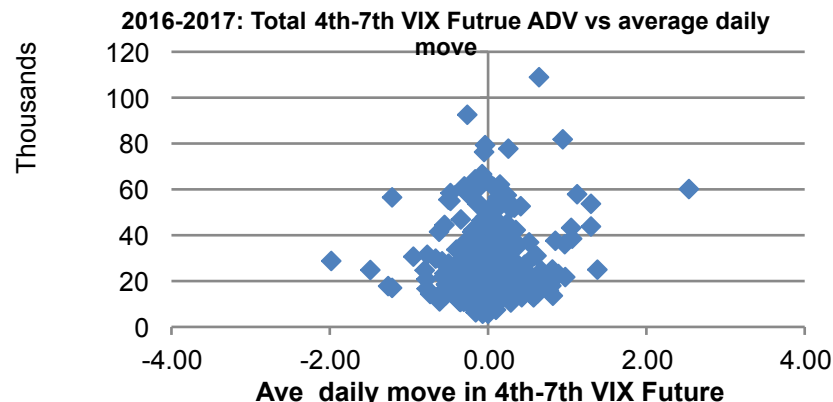
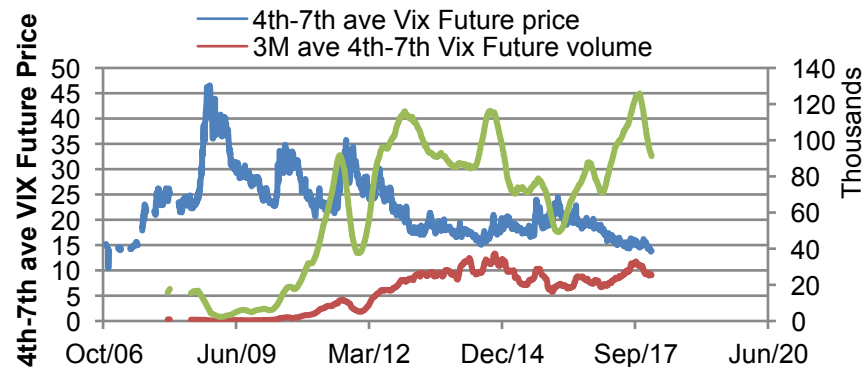
“Intra-day volumes” graph

- ⌘ 25% of the Future volumes is traded in the last hour

“4th-7th VIX Future ave 1Day move” table

4 th -7 th VIX Futures ave 1 day moves and Level				
Year	Max 1 Day move down (points / %)	Max 1 Day move Up (points / %)	Min VIX Synthetic Level	Max VIX Synthetic Level
2008	-2.81 / -7%	4.36 / 11%	21.46	46.54
2009	-3.91 / -9%	2.83 / 7%	25.65	43.92
2010	-2.61 / -8%	2.28 / 8%	22.75	34.83
2011	-2.58 / -9%	2.90 / 10%	20.69	35.78
2012	-1.49 / -6%	2.23 / 8%	19.50	30.14
2013	-1.44 / -7%	1.21 / 7%	16.98	21.39
2014	-1.51 / -7%	1.31 / 7%	15.06	20.96
2015	-1.50 / -4%	1.86 / 10%	16.59	23.94
2016	-1.98 / -9%	2.54 / 13%	17.95	24.47
2017	-1.21 / -7%	1.13 / 8%	14.25	18.46

Mid Term VIX Futures Price, Open interest and Volumes



Vega rebalance needs and Future volumes for ZIV along the worse path (recent)

8 June'16 (Brexit) and Aug'15 assuming full utilisation of proposed notional

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\$m			TVIX	VIX		TVIX	VIX	TVIZ	ZIV	total	4th -7th VIX Future Volume	
date	4 th -7 th VIX future ave		vega	vega	total vega	Notional	Notional	change in vega			Total	last hour (25%)
6/20/2016	20.56		-4.9	14.6	9.7	-50	-300					
6/21/2016	20.54	-0.02	-4.9	14.6	9.8	-50	-300	0.0	0.0	0.0	23.2	5.8
6/22/2016	20.40	-0.14	-4.8	14.8	10.0	-49	-302	0.0	0.2	0.2	32.4	8.1
6/23/2016	19.46	-0.94	-4.6	16.3	11.7	-45	-316	0.2	1.4	1.7	30.7	7.7
6/24/2016	21.99	2.54	-5.1	12.5	7.4	-56	-275	-0.5	-3.8	-4.3	60.1	15.0
6/27/2016	22.84	0.85	-5.3	11.6	6.3	-61	-264	-0.2	-0.9	-1.1	37.6	9.4
6/28/2016	20.86	-1.98	-4.8	13.8	9.0	-50	-287	0.5	2.2	2.7	28.8	7.2
6/30/2016	20.22	-0.64	-4.7	14.6	10.0	-47	-296	0.2	0.9	1.0	19.9	5.0
7/1/2016	20.35	0.13	-4.7	14.5	9.8	-48	-294	0.0	-0.2	-0.2	20.0	5.0
7/4/2016	20.35	0.00	-4.7	14.5	9.8	-48	-294	0.0	0.0	0.0	23.7	5.9
7/5/2016	20.35	0.00	-4.7	14.5	9.8	-48	-294	0.0	0.0	0.0	23.7	5.9

\$m			TVIX	VIX		TVIX	VIX	TVIZ	ZIV	total	4th -7th VIX Future Volume	
date	4 th -7 th VIX future ave		vega	vega	total vega	Notional	Notional	change in vega			Total	last hour (25%)
8/19/2015	17.31		-5.8	17.3	11.6	-50	-300					
8/20/2015	18.21	0.90	-6.1	15.6	9.6	-55	-284	-0.3	-1.7	-2.0	31.7	7.9
8/21/2015	18.79	0.57	-6.2	14.7	8.4	-59	-275	-0.2	-1.0	-1.1	81.6	20.4
8/24/2015	20.65	1.86	-6.8	12.0	5.2	-70	-248	-0.6	-2.6	-3.2	89.0	22.3
8/25/2015	20.81	0.16	-6.9	11.8	5.0	-71	-246	-0.1	-0.2	-0.2	62.5	15.6
8/26/2015	20.15	-0.66	-6.6	12.6	6.0	-67	-254	0.2	0.8	1.0	38.7	9.7
8/27/2015	20.36	0.21	-6.7	12.3	5.6	-68	-251	-0.1	-0.3	-0.3	38.2	9.6
8/31/2015	22.23	1.87	-7.3	10.3	3.0	-81	-228	-0.6	-2.1	-2.6	25.3	6.3
9/1/2015	23.94	1.71	-7.8	8.8	1.0	-93	-211	-0.5	-1.5	-2.0	40.9	10.2
9/2/2015	22.93	-1.01	-7.4	9.6	2.1	-85	-220	0.3	0.8	1.1	35.4	8.9
9/3/2015	23.11	0.18	-7.5	9.4	1.9	-87	-218	-0.1	-0.2	-0.2	30.0	7.5

Vega rebalance and PnL for worse 10 day path UP for ZIV since 2008

10 day up (0-15)			TVIZ	ZIV	total	TVIX	VIX	TVIZ	ZIV	total	PnL (no hedge on close)
date	synthetic VIX index		vega	vega	total vega	Notional	Notional	change in vega			-1.2
7/28/2017	14.60		-6.8	20.5	13.7	-50	-300				
7/31/2017	14.49	-0.11	-6.8	20.9	14.1	-49	-302	0.1	0.3	0.4	
8/1/2017	14.31	-0.18	-6.7	21.4	14.7	-48	-306	0.1	0.5	0.6	-0.1
8/2/2017	14.48	0.16	-6.8	20.9	14.1	-49	-302	-0.1	-0.5	-0.6	0.1
8/3/2017	14.61	0.14	-6.9	20.5	13.7	-50	-300	-0.1	-0.4	-0.5	-0.1
8/4/2017	14.75	0.14	-6.9	20.1	13.2	-51	-297	-0.1	-0.4	-0.4	-0.1
8/7/2017	14.66	-0.09	-6.9	20.4	13.5	-50	-299	0.0	0.2	0.3	0.0
8/8/2017	14.95	0.29	-7.0	19.6	12.6	-52	-293	-0.1	-0.8	-0.9	0.1
8/9/2017	15.08	0.13	-7.1	19.3	12.2	-53	-290	-0.1	-0.3	-0.4	-0.1
8/10/2017	16.02	0.94	-7.5	17.0	9.5	-60	-272	-0.4	-2.3	-2.7	-0.4
8/11/2017	16.28	0.26	-7.6	16.5	8.9	-62	-268	-0.1	-0.5	-0.7	-0.7

10 day up (15-20)			TVIZ	ZIV	total	TVIX	VIX	TVIZ	ZIV	total	PnL (no hedge on close)
date	synthetic VIX index		vega	vega	total vega	Notional	Notional	change in vega			-7.8
8/18/2015	17.11		-5.8	17.5	11.7	-50	-300				
8/19/2015	17.31	0.20	-5.9	17.1	11.2	-51	-296	-0.1	-0.4	-0.5	
8/20/2015	18.21	0.90	-6.2	15.4	9.2	-56	-281	-0.3	-1.7	-2.0	-0.4
8/21/2015	18.79	0.57	-6.4	14.5	8.1	-60	-272	-0.2	-0.9	-1.1	-1.1
8/24/2015	20.65	1.86	-7.0	11.9	4.9	-72	-245	-0.6	-2.6	-3.2	-2.1
8/25/2015	20.81	0.16	-7.0	11.7	4.7	-73	-243	-0.1	-0.2	-0.2	-0.5
8/26/2015	20.15	-0.66	-6.8	12.5	5.7	-68	-251	0.2	0.8	1.0	0.2
8/27/2015	20.36	0.21	-6.9	12.2	5.3	-70	-248	-0.1	-0.3	-0.3	0.2
8/28/2015	21.18	0.81	-7.1	11.3	4.1	-75	-238	-0.3	-0.9	-1.2	-0.3
8/31/2015	22.23	1.06	-7.5	10.2	2.7	-83	-227	-0.3	-1.1	-1.4	-1.3
9/1/2015	23.94	1.71	-8.0	8.7	0.7	-96	-209	-0.5	-1.5	-2.0	-2.4

Vega rebalance and PnL for worse 10 day path UP for ZIV since 2008

10 day up (20-30)			TVIZ	ZIV	total	TVIX	VIX	TVIZ	ZIV	total	PnL (no hedge on close)
date	synthetic VIX index		vega	vega	total vega	Notional	Notional	change in vega			-5.6
10/13/2008	29.03		-3.4	10.3	6.9	-50	-300				
10/14/2008	29.71	0.69	-3.5	9.9	6.3	-52	-293	-0.1	-0.5	-0.6	
10/15/2008	32.26	2.55	-3.8	8.3	4.5	-61	-268	-0.3	-1.6	-1.8	-1.4
10/16/2008	33.21	0.96	-3.9	7.8	3.9	-65	-260	-0.1	-0.5	-0.6	-1.8
10/17/2008	33.90	0.68	-4.0	7.5	3.5	-68	-255	-0.1	-0.3	-0.4	-0.4
10/20/2008	32.76	-1.14	-3.9	8.0	4.2	-63	-263	0.1	0.5	0.7	0.4
10/21/2008	33.31	0.55	-3.9	7.8	3.8	-65	-259	-0.1	-0.3	-0.3	0.4
10/22/2008	34.41	1.10	-4.0	7.3	3.2	-70	-250	-0.1	-0.5	-0.6	-0.4
10/23/2008	34.98	0.58	-4.1	7.0	2.9	-72	-246	-0.1	-0.2	-0.3	-0.4
10/24/2008	37.59	2.61	-4.4	6.1	1.7	-83	-228	-0.3	-1.0	-1.3	-0.8
10/27/2008	38.66	1.07	-4.5	5.7	1.2	-87	-221	-0.1	-0.3	-0.5	-1.4

10 day up (30-45)			TVIZ	ZIV	total	TVIX	VIX	TVIZ	ZIV	total	PnL (no hedge on close)
date	synthetic VIX index		vega	vega	total vega	Notional	Notional	change in vega			-2.2
11/4/2008	35.57		-2.8	8.4	5.6	-50	-300				
11/5/2008	37.56	1.99	-3.0	7.5	4.6	-56	-283	-0.1	-0.9	-1.0	
11/6/2008	39.26	1.70	-3.1	6.9	3.8	-61	-270	-0.1	-0.7	-0.8	-1.8
11/7/2008	39.39	0.13	-3.1	6.8	3.7	-61	-270	0.0	0.0	-0.1	-0.1
11/10/2008	39.63	0.24	-3.1	6.8	3.6	-62	-268	0.0	-0.1	-0.1	0.0
11/11/2008	40.29	0.66	-3.2	6.5	3.4	-64	-263	-0.1	-0.2	-0.3	-0.1
11/12/2008	41.49	1.20	-3.3	6.2	2.9	-68	-256	-0.1	-0.4	-0.5	-0.3
11/13/2008	40.49	-1.00	-3.2	6.5	3.3	-64	-262	0.1	0.3	0.4	0.5
11/14/2008	41.96	1.47	-3.3	6.0	2.7	-69	-252	-0.1	-0.5	-0.6	0.6
11/17/2008	43.07	1.11	-3.4	5.7	2.3	-73	-246	-0.1	-0.3	-0.4	-0.6
11/18/2008	43.92	0.85	-3.4	5.5	2.0	-76	-241	-0.1	-0.2	-0.3	-0.3

Vega rebalance and PnL for worse 10 day path UP for ZIV since 2008

10 day up (45+)			TVIZ	ZIV	total	TVIX	VIX	TVIZ	ZIV	total	PnL (no hedge on close)
date	synthetic VIX index		vega	vega	total vega	Notional	Notional	change in vega			1.5
11/27/2008	40.92		-2.4	7.3	4.9	-50	-300				
11/28/2008	40.89	-0.03	-2.4	7.3	4.9	-50	-300	0.0	0.0	0.0	
12/1/2008	45.26	4.36	-2.7	5.9	3.2	-61	-268	-0.2	-1.4	-1.7	0.1
12/2/2008	44.70	-0.55	-2.6	6.1	3.4	-59	-271	0.0	0.1	0.2	0.9
12/3/2008	44.42	-0.28	-2.6	6.1	3.5	-58	-273	0.0	0.1	0.1	-0.1
12/4/2008	45.92	1.50	-2.7	5.7	3.0	-62	-264	-0.1	-0.4	-0.5	0.1
12/5/2008	45.66	-0.26	-2.7	5.8	3.1	-62	-265	0.0	0.1	0.1	0.1
12/9/2008	46.43	0.76	-2.7	5.6	2.9	-64	-261	0.0	-0.2	-0.2	0.1
12/10/2008	45.96	-0.47	-2.7	5.7	3.0	-62	-264	0.0	0.1	0.1	0.1
12/11/2008	46.54	0.58	-2.7	5.6	2.8	-64	-260	0.0	-0.1	-0.2	0.1
12/12/2008	45.96	-0.58	-2.7	5.7	3.0	-62	-264	0.0	0.1	0.2	0.1

Vega rebalance and PnL for worse 10 day path DOWN for ZIV since 2008

10 day Down (0-15)			TVIZ	ZIV	total	TVIX	VIX	TVIZ	ZIV	total	PnL (no hedge on close)
date	synthetic VIX index		vega	vega	total vega	Notional	Notional	change in vega			-0.1
7/13/2017	14.81		-6.8	20.3	13.5	-50	-300				
7/14/2017	14.48	-0.34	-6.6	21.2	14.6	-48	-307	0.2	0.9	1.1	
7/17/2017	14.45	-0.02	-6.6	21.3	14.7	-48	-307	0.0	0.1	0.1	0.0
7/18/2017	14.51	0.06	-6.6	21.1	14.5	-48	-306	0.0	-0.2	-0.2	0.0
7/20/2017	15.03	0.51	-6.8	19.6	12.8	-51	-295	-0.2	-1.4	-1.7	-0.1
7/21/2017	14.96	-0.07	-6.8	19.8	13.0	-51	-297	0.0	0.2	0.2	0.1
7/24/2017	14.78	-0.18	-6.7	20.3	13.6	-50	-300	0.1	0.5	0.6	0.0
7/25/2017	14.78	-0.01	-6.7	20.3	13.6	-50	-300	0.0	0.0	0.0	0.0
7/26/2017	14.71	-0.06	-6.7	20.5	13.8	-49	-301	0.0	0.2	0.2	0.0
7/27/2017	14.59	-0.12	-6.6	20.8	14.2	-48	-304	0.1	0.3	0.4	0.0
7/28/2017	14.60	0.01	-6.6	20.8	14.2	-48	-304	0.0	0.0	0.0	0.0

10 day Down(15-20)			TVIZ	ZIV	total	TVIX	VIX	TVIZ	ZIV	total	PnL (no hedge on close)
date	synthetic VIX index		vega	vega	total vega	Notional	Notional	change in vega			-1.5
2/4/2014	18.95		-5.3	15.8	10.6	-50	-300				
2/5/2014	19.39	0.44	-5.4	15.1	9.7	-52	-293	-0.1	-0.7	-0.8	
2/6/2014	18.34	-1.05	-5.1	16.8	11.8	-47	-309	0.3	1.7	2.0	0.9
2/7/2014	17.59	-0.75	-4.9	18.3	13.4	-43	-322	0.2	1.4	1.7	-1.5
2/11/2014	17.14	-0.45	-4.7	19.2	14.5	-41	-330	0.1	1.0	1.1	-0.7
2/12/2014	17.11	-0.03	-4.7	19.3	14.6	-41	-330	0.0	0.1	0.1	0.0
2/13/2014	17.00	-0.11	-4.7	19.6	14.9	-40	-332	0.0	0.3	0.3	0.0
2/14/2014	16.91	-0.09	-4.7	19.8	15.1	-40	-334	0.0	0.2	0.2	0.0
2/17/2014	16.60	-0.31	-4.6	20.5	15.9	-38	-340	0.1	0.7	0.8	-0.1
2/18/2014	16.60	0.00	-4.6	20.5	15.9	-38	-340	0.0	0.0	0.0	0.0
2/19/2014	17.44	0.84	-4.8	18.5	13.7	-42	-323	-0.2	-2.0	-2.2	0.0

Vega rebalance and PnL for worse 10 day path DOWN for ZIV since 2008

10 day down (20-30)			TVIZ	ZIV	total	TVIX	VIX	TVIZ	ZIV	total	PnL (no hedge on close)
date	synthetic VIX index		vega	vega	total vega	Notional	Notional	change in vega			-2.1
9/4/2012	25.93		-3.9	11.6	7.7	-50	-300				
9/5/2012	25.48	-0.45	-3.8	12.0	8.2	-48	-305	0.1	0.4	0.5	
9/6/2012	24.44	-1.04	-3.6	13.0	9.4	-44	-318	0.2	1.0	1.2	-0.5
9/7/2012	23.74	-0.70	-3.5	13.8	10.2	-42	-327	0.1	0.8	0.9	-0.8
9/10/2012	24.14	0.40	-3.6	13.3	9.7	-43	-321	-0.1	-0.5	-0.5	0.3
9/11/2012	23.85	-0.29	-3.5	13.6	10.1	-42	-325	0.0	0.3	0.4	0.1
9/12/2012	23.11	-0.74	-3.4	14.5	11.1	-40	-335	0.1	0.9	1.0	-0.3
9/13/2012	22.08	-1.04	-3.3	15.9	12.6	-36	-350	0.2	1.4	1.5	-1.0
9/14/2012	22.18	0.10	-3.3	15.7	12.4	-36	-349	0.0	-0.1	-0.2	0.2
9/17/2012	21.93	-0.25	-3.2	16.1	12.8	-36	-352	0.0	0.4	0.4	0.0
9/18/2012	21.59	-0.34	-3.2	16.6	13.4	-34	-358	0.1	0.5	0.6	-0.1

10 day Down (30-45)			TVIZ	ZIV	total	TVIX	VIX	TVIZ	ZIV	total	PnL (no hedge on close)
date	synthetic VIX index		vega	vega	total vega	Notional	Notional	change in vega			-0.2
1/20/2009	43.92		-2.3	6.8	4.6	-50	-300				
1/21/2009	40.01	-3.91	-2.1	8.2	6.1	-41	-327	0.2	1.3	1.6	
1/22/2009	40.57	0.56	-2.1	7.9	5.9	-42	-322	0.0	-0.2	-0.3	0.9
1/23/2009	40.25	-0.32	-2.1	8.1	6.0	-42	-325	0.0	0.1	0.1	0.1
1/26/2009	39.77	-0.48	-2.0	8.3	6.2	-41	-329	0.0	0.2	0.2	-0.1
1/27/2009	38.32	-1.45	-2.0	8.9	6.9	-38	-341	0.1	0.6	0.7	-0.3
1/28/2009	37.46	-0.86	-1.9	9.3	7.4	-36	-348	0.0	0.4	0.5	-0.6
1/29/2009	36.78	-0.68	-1.9	9.6	7.8	-35	-355	0.0	0.3	0.4	-0.3
1/30/2009	38.03	1.25	-1.9	9.0	7.1	-37	-342	-0.1	-0.6	-0.7	0.5
2/2/2009	38.56	0.54	-2.0	8.8	6.8	-38	-338	0.0	-0.2	-0.3	-0.4
2/3/2009	38.23	-0.34	-2.0	8.9	7.0	-37	-341	0.0	0.2	0.2	0.1

Vega rebalance and PnL for worse 10 day path DOWN for ZIV since 2008

10 day up (45+)			TVIZ	ZIV	total	TVIX	VIX	TVIZ	ZIV	total	PnL (no hedge on close)
date	synthetic VIX index		vega	vega	total vega	Notional	Notional	change in vega			3.3
1/3/2008	24.09		-4.2	12.5	8.3	-50	-300				
1/4/2008	24.65	0.56	-4.2	11.9	7.6	-52	-293	-0.1	-0.6	-0.7	
1/7/2008	24.31	-0.34	-4.2	12.2	8.0	-51	-297	0.1	0.3	0.4	0.2
1/8/2008	25.11	0.81	-4.3	11.4	7.1	-54	-287	-0.1	-0.8	-0.9	0.3
1/9/2008	24.58	-0.54	-4.2	11.9	7.7	-52	-293	0.1	0.5	0.6	0.5
1/10/2008	24.17	-0.41	-4.2	12.3	8.2	-50	-298	0.1	0.4	0.5	-0.2
1/11/2008	25.54	1.38	-4.4	11.0	6.6	-56	-281	-0.2	-1.3	-1.6	0.7
1/15/2008	24.81	-0.74	-4.2	11.7	7.4	-53	-289	0.1	0.7	0.8	1.1
1/16/2008	24.57	-0.24	-4.2	11.9	7.7	-52	-292	0.0	0.2	0.3	-0.2
1/17/2008	26.20	1.64	-4.5	10.4	5.9	-59	-273	-0.3	-1.5	-1.7	0.4
1/18/2008	25.92	-0.28	-4.4	10.6	6.2	-57	-276	0.0	0.2	0.3	0.5

Current Flag Framework for VIX products

Flags in \$(m)										
VIX Synth	TVIX	XIV	TOTAL (TVIX+XIV)	VIIX	TVIZ	ZIV	VIIZ	UVXY	SVXY	TVIX and UVXY
0-15	max 17%	max 83%	-1800	-200	-50	-150	-200	+20 (or 10% of Market Cap)		-1,000
15-20	max 21%	max 79%	-1,900	-200	-50	-150	-200			-1,000
20-30	max 27%	max 73%	-2,050	-200	-50	-150	-200			-1,000
30-45	max 30%	max 70%	-2,150	-200	-50	-150	-200			-1,000
45+	max 33%	max 67%	-2,250	-200	-50	-150	-200			-1,000

- 8 Interpolation between regime for TVIX will be linear to avoid sudden jump between the flags as VIX goes into a different level

VIX Synth*	TVIX
0-15	-300
15-20	-400
20-30	-550
30-45	-650
45+	-750



VIX Synth*	TVIX	VIX Synth*	TVIX
15	-300		
16	-310	26	-415
17	-320	27	-430
18	-330	28	-445
19	-340	29	-460
20	-350	30	-475
21	-360	31	-490
22	-370	32	-505
23	-380	33	-520
24	-390	34	-535
25	-400	35	-550